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Description

[COOLING GARMENT FOR USE WITH A BULLET PROOF VEST]

BACKGROUND OF INVENTION

[0001] Field of the Invention

[0002] The present invention relates generally to a body cooling garment, and, more particularly, to a garment that provides a person wearing a bullet proof vest or other protective vest, cooling air on the skin areas under the bullet proof vest.

[0003] Description of Related Art

[0004] Bullet proof vests and other protective garments have become a necessity for law enforcement and military personnel. These vests are made of heavy duty, strong materials that insulate and generally restrict air flow from the portions of the body which the vests cover. The body protected areas are generally the chest, back and sides. The vests tend to trap body heat and cause perspiration to ac-

cumulate. The resulting body heating and wetness is undesirable and uncomfortable to the wearer, and may cause the vest to degrade and fail prematurely. The degradation is especially dangerous to the wearer because the degradation is not obvious to a wearer. The vest wearer can suffer dehydration and skin irritation from the excessive sweating.

[0005] Air circulation devices for protective vests are known in the art. However, they are bulky and inefficient. Furthermore, in several embodiments they blow a positive volume of air through the vest that can escape resulting in inefficiency. In addition, the circulation devices tend to absorb unwanted moisture unnecessarily. Furthermore, those circulation devices which are powered may not be readily detached so that the wearer may move quickly to where the wearer is needed.

[0006] In the prior art, U.S. Patent No. 4,451,934 issued to Gioello June 5, 1984 shows a ribbed ventilating undergarment for protective garments. This garment is bulky with large ribs and does not provide an exhaust draw to remove perspiration.

[0007] U.S. Patent No. 5,564,124 issued to Elsherif, et al. October 15, 1996 shows a personal body ventilation system which

uses a positive air pressure blown over a large area with a fan. It does not show individual channels and does not have a device for using exhaust flow to remove perspiration.

[0008] U.S. Patent No. 5,970,519 issued to Weber October 26, 1999 shows an air cooling garment for medical personnel. This device has a plurality of tiny holes that release air that is blown into the garment. It does not have effective channels for removing perspiration or for separating the garment itself from the skin.

[0009] U.S. Patent No. 6,260,201 issued to Rankin July 17, 2001 shows a portable cooling device. This device uses a tubular effect that has holes for moving the air. It does not provide channels to separate the garment nor exhaust to remove perspiration.

[0010] U.S. Patent No. 6,276,155 issued to Siman-Tov, et al. August 21, 2001 shows a personal cooling apparatus and method and U.S. Patent No. 6,295,648 issued October 2, 2001 to the same inventors disclose a garment with an air moving device that uses positive pressure to pump air around a central baffle ring at the base of the garment which can be uncomfortable and cumbersome.

[0011] U.S. Patent No. 6,596,019 issued to Turner, et al. July 22,

2003 shows an apparel ventilation system for athletes that includes an air system that has holes for expelling air flow.

[0012] None of the devices in the prior art show the use of a garment that employs an air exhaust system, a plurality of raised ribs on one side to direct and circulate exhaust air over the body to aid in the removal of moisture, evaporation and cooling.

[0013] The present invention can be used with bullet proof vests, ballistic clothing and other protective garments often used by law enforcement and military personnel.

[0014] Therefore, what is needed in the art is a flexible, light weight cooling garment which efficiently and effectively removes heat and moisture from a wearer employing a portable, detachable exhaust fan.

[0015] What is also needed is a cooling garment that fits beneath a protective vest which is air cooled and efficient and effective in the evaporation and removal of sweat.

SUMMARY OF INVENTION

[0016] The present invention provides a cooling garment for cooling a human being that is also wearing a protective vest such as a bullet proof vest. The cooling garment comprises a thin sheet body (shaped like a vest for the

upper torso) with an inner surface, an outer surface and a plurality of flexible raised ribs forming air channels mounted on said inner surface directed generally toward the wearer, and a fan for drawing air exhaust air from the air channels mounted in fluid communication with the air chambers. The shape of the garment is to cover the upper torso of a human being, front, back and sides, and a shape that mimicks the shape of the protective bullet proof vest worn outside the cooling garment. The cooling garment fabric body includes a sturdy elastic fabric, similar to that sold under the trademark Spandex, that stretches, is thin and can have a water resistant aluminum colored outer surface texture to reflect exterior heat. The stretchable fabric causes the air channel protrusions to conform to the body contours. The fan motor, the fan blades, the blade rotation and direction, and a connectable baffle are all directed to draw out exhaust air from the air channels. The cooling garment body air channel thin protrusions or ribs are made of a lightweight, flexible, moisture resistant material, such as polyethylene foam. The fan housing is attached to the cooling garment at a location such as front and middle by a detachable baffle for conducting negative air pressure

from the fan.

[0017] The negative air pressure (exhaust) created by the fan is more effective in removing heat and perspiration in the air channels. Positive air pressure would leak out of spaces and is difficult to conduct through the many turns of the channels.

[0018] A power source such as a vehicle adaptor to connect to a vehicle cigarette lighter plug or a portable battery pack electrically connects with the fan. Furthermore, the fan and fan housing has a quick disconnect baffle from the garment air exhaust port because the fan and power source disconnect together at the baffle. The air flow through the back garment is connected to the fan by a continuation of air channels passing under the arms or over the shoulders.

[0019] In yet still another embodiment, the garment could be constructed without the fan. The garment body would comprise a thin, flexible sheet of material having an inner surface, an outer surface and a plurality of generally moisture resistant protrusions forming air flow channels on said inner surface directed generally toward a wearer, wherein the protrusions are adapted for allowing air flow through a top portion and a bottom portion of the gar-

ment front, back and sides.

[0020] The cooling garment could be integrated into a bullet proof vest or other ballistic vest to function as a single garment.

[0021] Accordingly, it is an object of the present invention to provide a garment for use with and under a bullet proof or protective vest which efficiently and effectively cools the user.

[0022] It is another object of the invention to provide a cooling garment for a protective vest that is efficient and effective in the removal of moisture and heat with exhaust air.

[0023] In accordance with these and other objects which will become apparent hereinafter, the instant invention will now be described with particular reference to the accompanying drawings.

Brief Description of Drawings

[0024] Figure 1A shows an elevational view of the inside surface of the front section of the invention that is worn on a human chest area.

[0025] Figure 1B shows an elevational view of the outside surface of the front section of the invention shown in Figure 1A.

[0026] Figure 2A shows an elevational view of the inside surface of the back section of the invention worn on the back of a

person.

[0027] Figure 2B shows an elevational view of the outside surface of the back section of the invention shown in Figure 2A.

[0028] Figure 3 shows a cross sectional view along line 3-3 of Figure 2A of the invention.

[0029] Figure 4 shows a perspective view of a user using the preferred embodiment of the invention.

[0030] Figure 5A shows a perspective front view of the fan, fan housing and a partial cutaway view of the baffle used in the invention.

[0031] Figure 5B shows a rear perspective view of the fan, fan housing and baffle connector.

[0032] Figure 6 shows a side elevational view, partially in cross section of the fan, fan housing, baffle and garment port.

DETAILED DESCRIPTION

[0033] With reference to the drawings, Figures 1A and 1B show the inside and outside of the chest cover section of the garment body respectively of the invention 10. The use of a tee shirt under the cooling garment is preferred for wicking perspiration. As shown in Figures 1A and 1B, the cooling garment comprises a chest cover section that has an inside surface shown in Figure 1A as section 12 having a thin, flexible fabric body 18 made of a stretchable fabric

and a plurality of raised, straight and curved, elongated protrusions 24 made of flexible closed cell foam that are glued and/or sewn on one side of the fabric body 18. The adjacent raised protrusions 24 are arranged somewhat parallel to form individual air channels 19, 21 and 23. A fabric baffle area 34 at the base of the chest section 12 connects the air channels together in air flow to the fan intake and is located on the side opposite the fan intake as shown in Figure 1B. Garment air exhaust port inlet 40a is connected to a fan not shown in Figure 1B. The size of the cooling garment is adjustable to a specific person by trimming the length of the areas that fit under the arms and that are connectable using hook and pile fasteners 22a. A raised protrusion 54 forms the bottom channel barrier to contain exhaust air in cloth baffle 34.

[0034] Referring now to Figure 1B, the outside surface of the chest section 12 is shown that includes a reflective surface material 17 that reflects heat coming from outside. The bottom of chest panel 12 includes an exhaust port 40 having inlet 40a that connects removeably to a fan baffle and electrical fan and housing that draws air from the air channels. The fan exhaust port 40 exhausts air outwardly, drawing air and perspiration from the interior channels

19, 21 and 23, especially as shown in Figure 1A, into the fan housing and venting the exhaust air out to the ambient air. The fan, fan switch and power source are explained below. The chest section 12 also includes hook and loop fasteners 22 on each lateral end that allow the cooling garment to be attached to the back section or panel that is shown in Figures 2A and 2B. The air channels in the back of the garment are connected to the air channels in the chest section forming the entire cooling garment comprising the front panel 12 and the back panel 14.

[0035] Referring now to Figure 2A, the inside surface of the back section panel 14 of the cooling garment that is worn on the person"s back area is shown. The back section 14 includes a plurality of somewhat parallel raised projections 24 arranged both straight and curved that form and continue the air passages or channels 19, 21 and 23 that connect with the front section 12. The back section 14 air passages are subject to exhaust negative pressure from a fan along the skin area of the wearer or along a tee shirt. The outside surface of the back section 14 (Figure 2B) includes a reflective material 20 that acts to reflect heat away from the entire device from the ambient air and to

prevent sweat from accumulating on a bullet proof vest worn over the cooling garment. The back section 14 also includes hook and loop fasteners 22a that engage the fasteners on the front section or chest section 12 (Figures 1A and 1B) so that the front section 12 and the back section 14 together when joined together by the hook and pile fasteners 22a form a cooling garment that covers the front chest and the back torso area of a person wearing the garment against his or her skin or preferably against a plain cotton tee shirt. The tee shirt can wick perspiration. The cooling garment is worn under a protective, ballistic or shrapnel vest and, typically, a shirt. Because the cooling garment is made of fabric similar to a fabric sold under the trademark Spandex, the fabric stretches and using the hook and loop fasteners, the garment can be adjusted and stretched on the torso of the wearer in such a way that the fabric generally conforms to the body contours. The air channels such as passages 19, 21 and 23 allow air to be transferred to the fan exhaust to remove perspiration and warm air adjacent the skin area of the wearer. The round protrusions 24 (Figure 3) allow the surfaces on the upper portion of the protrusions to engage the body (or tee shirt) to form somewhat sealed passages to allow air flow

to do its job cooling the person. The tee shirt, if worn, offers more surface area to aid in the sweat evaporation by wicking.

[0036] Referring now to Figure 3, a cross section of the back section 14 of the cooling garment as shown in Figure 2A through line 3-3 displays the protrusions 24 that are glued and/or sewn to the back section of fabric body 14 with glue 24a. or thread 24b. Channel or passage 19 is shown on one side of fabric 18. Element 20 is the reflective water resistant vinyl surface coating on the outside of the fabric 18. Fabric 18 fits around the back torso area of a human being. The air passage spaces between adjacent raised protrusions 24 can be varied at the factory but are preferably between an inch and two and a half inches apart and are substantially parallel but can be curved around various portions of the body for comfort and for best results in the air flow in each passage. Each protrusion 24 can be one fourth inch or more high. Note that each protrusion 24 is made of an elongated flexible closed cell foam strip that does not absorb moisture. Each protrusion may be covered with additional surface coating to prevent moisture absorption so that sweat can be exhausted by the air flow through the cooling garment.

[0037] Referring now to Figure 4, a law enforcement officer 42 is shown wearing the cooling garment 12 beneath a uniform. The fan 30 is visible and exposed for quick disconnect. The fan duct and cooling garment port are beneath the shirt in the central portion of the body. Also, the power source such as a battery pack 44 may be put in a pocket or connected to the belt. Using the present invention, a law enforcement officer 42 as shown in Figure 4 can receive cooling air that exhausts perspiration while still wearing the bullet proof vest or other protective vest underneath a shirt 42a. If the outer shirt 42a is not worn or a short waist shirt is worn, the fan and fan duct would be visible along with the battery pack.

[0038] Figures 5A, 5B and Figure 6 show the fan blades 28, a fan motor 28a mounted in fan housing 30 and a connectable exhaust baffle 36a that connects to the cooling garment at the baffle inlet 36 to garment port 40. The baffle inlet 36 is detachable from port outlet 40a and is shaped elliptically for more efficient air flow and size reduction for the comfort of the wearer. The exhaust baffle 36a is elliptically shaped and connects to the fan housing 30, The fan blades 28 are turned by the fan motor 28a. The direction of rotation of the fan blades 28 is such so that the fan ex-

hausts air out into the ambient air. The fan action lowers air pressure by drawing air from the air channels (19, 21 and 23) that are adjacent the skin area of the wearer.

[0039] Referring now to Figure 6, the baffle 36a connected to fan housing 30 can be separated at the inlet 36 from the cooling garment port opening 40a when not in use. The port 40 is the elliptically shaped duct that is connected directly to the cooling garment which allows air communication between the passageways of the cooling garment and the fan housing 30. The port outlet at 40a allows the fan housing 30 and power source and switch to be completely removed quickly if the person wearing the cooling garment needs to pursue someone or for any other reason wishes to become disengaged from the fan housing 30. The front panel 12 is connected to the port duct 40 along flat port duct panel 38 integrally molded to the port duct 40. The panel 38 is glued to fabric 18 by glue 60. The fabric 18 forms the body of front (chest) panel 12. Battery pack 44 holds batteries 46 and 48. The battery pack 44 is connected electrically to fan motor 28a through electrical on/off switch 50 by wires 52. In lieu of battery power, the fan motor could be plugged into a vehicle cigarette lighter plug when the cooling garment is used by law enforce-

ment or other personnel in a vehicle.

[0040] In an alternate embodiment, there may be environments where because of the outside air temperatures, a fan, battery and switch may not be necessary wherein the air passages or channels could be vented to the ambient air by opening each passage at the top and bottom edge of the cooling garment in front and back which allows air flow from ambient air to proceed into the air passages with the top and bottom of the cooling garment front and back being exposed to the ambient air.

[0041] The present invention may include alternate embodiments wherein the cooling garment could be used for cooling the chest area only with a fan and a front panel covering the chest excluding the back area. In another embodiment, the cooling garment could cool the back area of the individual only with a fan. The back cooling garment with a fan could be worn separately as could the front or chest cooling garment with the fan.

[0042] The primary purpose of the invention is for use with what is conventionally known as a bullet proof vest, ballistic vest, shrapnel vest or protective vest. One aspect of the invention is that the cooling garment actually has a synergistic effect when used with a bullet proof vest or any

other protective ballistic or shrapnel type vest in that by using the cooling garment, the impact of a bullet or shrapnel striking the cooling garment could also be reduced thereby improving the overall performance of the protective garment as well as having the wearer be cooled at the same time. The closed cellular foam used with the present invention is to be lightweight, somewhat rigid but flexible and not absorb moisture such as perspiration. It could be made out of several different types of plastic foam including polyurethane and polyethylene.

[0043] The cooling garment could be worn by itself for cooling purposes for athletic events or in any other type of environment that demands cooling where some type of over garment would be worn. In certain climates, it may not be necessary to have a fan and in such cases the back and front of the garment would be vented to the ambient air to allow a flow of air by convection through the garment and allowing the air to escape near the top portion of the garment on each side of the individual.

[0044] The cooling garment works through the flow of air over the skin or preferably a tee shirt that can wick perspiration with the air picking up the moisture and transferring moisture and heat through the exhaust of the fan out-

board drawing the air from the lower back portion with the full garment around to the front portion where the fan exhausts the heated moist air.

[0045] Different types of protective garments are known that could be called ballistic protective garments, bullet resistant vests, shrapnel vests or any type of protective vest. The present invention could be integrated into a bullet resistant or bullet proof vest or other protective garment such that the cooling channels would be mounted on the inside of the protective garment as described in the specification.

[0046] The instant invention has been shown and described herein in what is considered to be the most practical and preferred embodiment. It is recognized, however, that departures may be made therefrom within the scope of the invention and that obvious modifications will occur to a person skilled in the art.